AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

1.   (Currently Amended) An encoding apparatus for embedding data in a compressed data stream, the apparatus comprising:

a partial decoder receptive of the compressed data stream and operable to partially decode the compressed data stream, thereby obtaining a partially decoded data stream having quantization indices;

a data embedder in communication with said partial decoder and receptive of the data and the partially decoded data stream, said data embedder operable to embed the data into the quantization indices using an enhanced spread spectrum technique, thereby obtaining a data-embedded partially decoded data stream; and

a partial encoder in communication with said data embedder, said partial encoder operable to partially encode the data-embedded partially decoded data stream, thereby obtaining a data-embedded compressed data stream,

wherein the partially decoded data stream has variance, and wherein said data embedder is operable to reduce the variance of the partially decoded data stream by: (a) sorting the partially decoded data stream in at least one of ascending and descending order, thereby obtaining a sorted sequence; (b) constructing a new partially decoded data stream by taking the difference of every pair of two consecutive samples in the sorted sequence while alternating the sign of every other difference value; and (c) substituting the new partially decoded audio data stream for the partially decoded audio

data stream, thereby causing watermark to be added to the new partially decoded audio data stream.

2.   (Original) The apparatus of claim 1 further comprising an index selector in communication with said partial decoder, said index selector operable to select a plurality of the quantization indices, thereby obtaining selected indices, and to determine respective amounts by which to modify the selected indices,

wherein said data embedder is operable to embed the data into the quantization indices by modifying the selected indices according to the respective amounts, thereby obtaining a data-embedded partially decoded data stream.

3.   (Original) The apparatus of claim 2, wherein said index selector is operable to:

choose indices corresponding to ranges within a sensitive portion of a human sensory range;

discard zero indices; and

always determine a minimum amount.

4.   (Original) The apparatus of claim 1, wherein said data embedder is receptive of an encoding key and operable to embed the data based on the encoding key.

5.   (Cancelled)

6.   (Cancelled)

7.   (Original) The apparatus of claim 1, wherein said partial encoder and said partial decoder are operate via same codebooks.

8.   (Currently Amended) A decoding apparatus for extracting data embedded in a compressed data stream having embedded data, the apparatus comprising:

a partial decoder receptive of the compressed data stream and operable to partially decode the compressed data stream, thereby obtaining a partially decoded data stream having quantization indices; and

a correlation detector in communication with said partial decoder and operable to extract the data from the quantization indices, wherein the data was embedded using an enhanced spread spectrum technique variance of a partially decoded data stream is reduced by: (a) sorting the partially decoded data stream in at least one of ascending and descending order, thereby obtaining a sorted sequence; (b) constructing a new partially decoded data stream by taking the difference of every pair of two consecutive samples in the sorted sequence while alternating the sign of every other difference value; and (c) substituting the new partially decoded audio data stream for the partially decoded audio data stream, thereby causing watermark to be added to the new partially decoded audio data stream.

9.   (Original) The apparatus of claim 8, wherein said correlation detector is receptive of a decoding key, and wherein said correlation detector is operable to extract the data from the quantization indices based on the decoding key.

10.   (Currently Amended) A method for embedding data in a compressed data stream, the method comprising:

receiving the data;

receiving the compressed data stream;

partially decoding the compressed data stream, thereby obtaining a partially decoded audio data stream having quantization indices;

embedding the data into the quantization indices using an enhanced spread spectrum technique, thereby obtaining a data-embedded partially decoded data stream; and

partially encoding the data-embedded partially decoded data stream, thereby obtaining a data-embedded compressed data stream,

wherein the partially decoded data stream has variance, the method further comprising reducing the variance of the partially decoded data stream, including: (a) sorting the partially decoded data stream in at least one of ascending and descending order, thereby obtaining a sorted sequence; (b) constructing a new partially decoded data stream by taking the difference of every pair of two consecutive samples in the sorted sequence while alternating the sign of every other difference value; and (c) substituting the new partially decoded data stream for the partially decoded data

stream, thereby causing watermark to be added to the new partially decoded audio data stream.

11.   (Original) The method of claim 10 further comprising:

selecting a plurality of the quantization indices, thereby obtaining selected indices; and

determining respective amounts by which to modify the selected indices,

wherein said embedding the data into the quantization indices corresponds to modifying the selected indices according to the respective amounts.

12.   (Original) The method of claim 11, wherein said selecting comprises:

choosing indices corresponding to ranges within a sensitive portion of a human sensory range; and

discarding zero indices.

13.   (Original) The method of claim 11, wherein said determining corresponds to always determining a minimum amount.

14.   (Original)   The method of claim 10 further comprising receiving an encoding key, wherein said embedding the data includes modifying the selected indices based on the encoding key.

15.   (Cancelled)

16.   (Cancelled)

17.   (Original)   The method of claim 10, wherein said partially encoding and said partially decoding are performed via same codebooks.

18.   (Cancelled)

19.   (Cancelled)

20.   (Previously Presented)   The apparatus of claim 1, wherein side information is communicated from said partial decoder to said partial encoder, the side information including information relating to at least one of: an original codebook used by said partial decoder; an original host signal that is the compressed data stream received by said partial decoder; or a decoding process employed by said partial decoder

21.   (Previously Presented)   The apparatus of claim 20, wherein the side information includes information relating to the original codebook used by said partial decoder.

22.   (Previously Presented)   The apparatus of claim 20, wherein the side information includes information relating to the original host signal that is the compressed data stream received by said partial decoder.

23. (Previously Presented) The apparatus of claim 20, wherein the side information includes information relating to the decoding process employed by said partial decoder.

24. (New) The apparatus of claim 1, wherein an enhanced sequence $y = y_1, y_2, \cdots, y_{N/2}$, is derived in accordance with $y_j = (-1)^j (x_{s_{2j-1}} - x_{s_{2j}}), \ 1 \leq j \leq N/2$ (assuming N is even).

25. (New) The apparatus of claim 8, wherein an enhanced spread spectrum decoding technique is employed as a complement to the enhanced spread spectrum encoding technique, and watermark extraction proceeds according to the following:

w' = 1 if $\sum_n x'(n)k'(n) > E\left[\sum_n x(n)k(n)\right]$ and w' = 0 otherwise,

where w' refers to an extracted watermark and E denotes an expected value.

26. (New) The method of claim 10, wherein an enhanced sequence $y = y_1, y_2, \cdots, y_{N/2}$, is derived in accordance with $y_j = (-1)^j (x_{s_{2j-1}} - x_{s_{2j}}), \ 1 \leq j \leq N/2$ (assuming N is even).